

# A New Voronoi-Based Surface Reconstruction Algorithm

(1998) (Make Corrections) (124 citations)

Nina Amenta, Marshall Bern, Manolis Kamvysselis  
Computer Graphics

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**Abstract:** We describe our experience with a new algorithm for the reconstruction of surfaces from unorganized sample points in IR 3 . The algorithm is the first for this problem with provable guarantees. Given a "good sample" from a smooth surface, the output is guaranteed to be topologically correct and convergent to the original surface as the sampling density increases. The definition of a good sample is itself interesting: the required sampling density varies locally, rigorously capturing the... ([Update](#))

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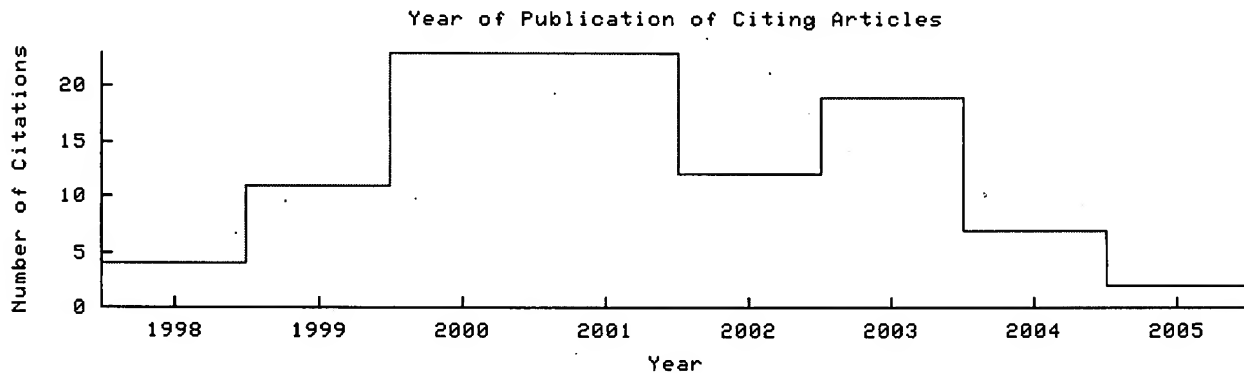
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Method for Building Complex Models from Range **Images** Brian Curless and Marc Levoy Stanford surfaces by integrating groups of aligned range **images**. A desirable set of properties for such approaches, Boissanat [2] describes a method for **Delaunay** triangulation of a set of points in 3-space. [www-graphics.stanford.edu/papers/volrange/volrange\\_lowres\\_figs.ps.gz](http://www-graphics.stanford.edu/papers/volrange/volrange_lowres_figs.ps.gz)

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[The Quickhull Algorithm for Convex Hulls - Barber, Dobkin, Huhdanpaa \(1995\) \(Correct\) \(89 citations\)](#)

metallurgy, urban planning, cartography, **image** processing, numerical integration, statistics, incremental algorithms for convex hull and **Delaunay** triangulation. We provide empirical evidence hull -for example, halfspace intersection, **Delaunay** 116 Fayerweather Street, Cambridge, MA 02138, [ftp.cs.princeton.edu/reports/1995/565.ps.Z](ftp://cs.princeton.edu/reports/1995/565.ps.Z)

[On Levels of Detail in Terrains - De Berg, Dobrindt \(1995\) \(Correct\) \(39 citations\)](#)

triangles is this large. Fortunately, a realistic **image** of the terrain is only crucial when one is close landing) should not cause disturbing 'jumps' in the **image**. On the other hand, the reduction of the number advantage of our structure is that it uses the **Delaunay** triangulation at each level, so that triangles [ftp.cs.uu.nl/pub/RUU/CS/techreps/CS-1995/1995-12.ps.gz](ftp://cs.uu.nl/pub/RUU/CS/techreps/CS-1995/1995-12.ps.gz)

[Three-Dimensional Modeling of Human Organs and Its Application to ... - Geiger \(1993\) \(Correct\) \(36 citations\)](#)

[geiger@sophia.inria.fr](mailto:geiger@sophia.inria.fr) Programme 4: Robotique, **Image** et Vision. R'esum'e Nous pr'esentons une calculations in order to obtain a two-dimensional **image**. Computers are used for **image** treatment, une approximation grace `a la triangulation de **Delaunay**. On pr'esente des r'esultats obtenus `a partir <ftp://sop.inria.fr/prisme/NUAGES/Nuages/R2105.ps.gz>

[Multiresolution Modeling and Visualization of ... - Cignoni, De.. \(1994\) \(Correct\) \(33 citations\)](#)

di Francia) 16149 Genova ITALY -Email: [puppo@image.ge.cnr.it](mailto:puppo@image.ge.cnr.it) CNUCE -Consiglio Nazionale delle the dataset, but also by their shape. Interactive **image** generation may not be feasible for very large 23]Specifically, we have based our model on the **Delaunay** tetrahedralization, that offers suitable [www.ima.ge.cnr.it/STAFF/PUPPO/PS/ACM-VV94.ps.gz](http://www.ima.ge.cnr.it/STAFF/PUPPO/PS/ACM-VV94.ps.gz)

[Skeleton-Space: a Multiscale Shape Description Combining Region.. - Ogniewicz \(1994\) \(Correct\) \(26 citations\)](#)

which directly operate upon the gray-valued **image** [7, 8, 9]In order to compute a multiscale MAT, [1] F. Meyer, Skeletons in digital spaces,in **Image** Analysis and Mathematical Morphology (J. Serra, from the straight line dual of the VD, the **Delaunay** triangulation [14]Let us assume that each [hri.harvard.edu/pub/skeletons/cvpr94.ps.Z](http://hri.harvard.edu/pub/skeletons/cvpr94.ps.Z)

[Error-bounded Reduction of Triangle Meshes with Multivariate... - Bajaj, Schikore \(1996\) \(Correct\) \(25 citations\)](#)

reduce the size of a mesh with little compromise in **image** quality. Similar techniques have been used for shaped domains. Computer Vision, Graphics and **Image** Processing, 32:127-140, 1985. 3] L. De the originally dense set of points, and compute a **Delaunay** triangulation [2, 3, 4, 12, 17, 19]Silva, et. [king.ticam.utexas.edu/CCV/papers/surf4.ps.gz](http://king.ticam.utexas.edu/CCV/papers/surf4.ps.gz)

[Real-Time, Continuous Level of Detail Rendering of ... - Lindstrom, Koller.. \(1996\) \(Correct\) \(25 citations\)](#)

to bound the maximum error of the projected **image**. The appropriate level of detail is computed and performs at interactive frame rates with high **image** quality. Typically, the number of rendered triangulation methods (such as those that employ **Delaunay** triangulation techniques)Much of the previous [ftp.gvu.gatech.edu/pub/gvu/tr/96-02.ps.Z](http://ftp.gvu.gatech.edu/pub/gvu/tr/96-02.ps.Z)

Simplex Meshes: a General Representation for 3D Shape.. - Delingette (1994) (Correct) (22 citations)  
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 Herv'e Delingette Programme 4 -Robotique, **image** et vision Projet Epidaure Rapport de recherche  
 hand, are well-suited for local topology control. **Delaunay** triangulations[Boi84] for instance, generate an  
<ftp.inria.fr/INRIA/tech-reports/RR/RR-2214.ps.gz>

General Object Reconstruction based on Simplex Meshes - Delingette (1997) (Correct) (22 citations)  
 Delingette \*Th#me 3 Interaction homme-machine, **images**, donn#es, connaissances Projet Epidaure \*  
 reconstruction algorithm of range and volumetric **images**, based on deformable simplex meshes. The  
 Object Reconstruction based on Simplex Meshes 5 **Delaunay** tetrahedrisation and serial slice reconstruction  
<ftp.inria.fr/INRIA/tech-reports/RR/RR-3111.ps.gz>

Skeletal Reconstruction of Branching Shapes - Ferley, Cani-Gascuel, Attali (1997) (Correct) (14 citations)  
 A large amount of work has been done in **image** analysis on the computation of the skeleton 1,  
 the implicit surface 17 In practice, the **images** illustrating this paper have rather been rendered  
 an heuristic must be used. We first compute the **Delaunay** tetrahedrization of the boundary points p i ,  
[www-imagis.imag.fr/Publications/ferley/CGF97.ps.gz](http://www-imagis.imag.fr/Publications/ferley/CGF97.ps.gz)

Fast Lighting Independent Background Subtraction - Yuri Ivanov (1998) (Correct) (14 citations)  
 fields mapping the primary (or key) background **image** to each of the additional reference background  
 to each of the additional reference background **images**. At runtime, segmentation is performed by  
 of neighboring triangular patches by performing **Delaunay** triangulation of the set, and then interpolate  
[whitechapel.media.mit.edu/pub/tech-reports/TR-437.ps.Z](http://whitechapel.media.mit.edu/pub/tech-reports/TR-437.ps.Z)

Right Triangular Irregular Networks - Evans, Kirkpatrick, Townsend (1997) (Correct) (13 citations)  
 the eye position, could be used, but the resulting **image** may be unacceptably coarse in areas close to the  
 of addressing spatial regions with application to **image** encoding [11, 10] and adaptive mesh generation  
 component, are triangulated (typically using a **Delaunay** triangulation) and linear interpolation is used  
[www.cs.arizona.edu/people/will/papers/rtn.ps.gz](http://www.cs.arizona.edu/people/will/papers/rtn.ps.gz)

Interactive Direct Volume Rendering Of Curvilinear And.. - Williams (1992) (Correct) (12 citations)  
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 of the interior of a solid region in a 2D **image** [31]This thesis focuses on volume rendering as  
[polaris.cs.uiuc.edu/reports/1243.ps.gz](http://polaris.cs.uiuc.edu/reports/1243.ps.gz)

Reconstructing Surfaces from Unstructured 3D Points - Fua, Sander (1992) (Correct) (12 citations)  
 assumed to be nonregular samples from underlying **imaged** surfaces. Most existing approaches to this  
 then demonstrate our technique using stereo depth **images** corresponding to complex indoor and outdoor  
 be interpolated using simple techniques such as **Delaunay** triangulation. In effect, we are both segmenting  
[www.ai.sri.com/pubs/papers/Fua9201:Reconstructing/document.ps.gz](http://www.ai.sri.com/pubs/papers/Fua9201:Reconstructing/document.ps.gz)

An Exact Interactive Time Visibility Ordering Algorithm.. - Silva, Mitchell.. (1998) (Correct) (10 citations)  
 NY, 10598 p.williams@computer.org. onto the **image** plane, in visibility order, and incrementally  
 the cell's color and opacity into the final **image**. Projective methods, as opposed to those using  
 classes of meshes (e.g.rectilinear meshes and **Delaunay** meshes [13]it is known that a visibility  
[cg.ams.sunysb.edu/~csilva/papers/volvis98.ps.gz](http://cg.ams.sunysb.edu/~csilva/papers/volvis98.ps.gz)

Selective Culling of Discontinuity Lines - Hedley, Worrall, Paddon (1997) (Correct) (9 citations)  
 in the viewer when they look at the rendered **image** as they would have if they were looking at the  
 the 2-norms metric which is defined for an n by m **image** as follows:  $k A k 2 = 0 @ 1 n m n X i = 1 m$   
 constraint edges inserted into a constrained **Delaunay** triangulation. Discontinuities are classified  
[hypatia.dcs.qmw.ac.uk/data/uk/cs.bris.ac.uk/1997/1997-hedley.ps.gz](http://hypatia.dcs.qmw.ac.uk/data/uk/cs.bris.ac.uk/1997/1997-hedley.ps.gz)

A Linear-Time Algorithm For Testing The Inscribability Of.. - Dillencourt, al. (1995) (Correct) (9 citations)  
 of a planar graph G is denoted by G and the **image** of  $v \in V(G)$  under the dual map is denoted by v  
 and the bounding triad of L are, respectively, the **images** under the dual map of the bounding face and the  
 connection between inscribable polyhedra and **Delaunay** triangulations 6 and the importance of  
[www.neci.nj.nec.com/homepages/wds/trivalent-inscrib.ps](http://www.neci.nj.nec.com/homepages/wds/trivalent-inscrib.ps)

Adaptive Delaunay Triangulation for Attractor Image Coding - Davoine, Chassery (1994) (Correct) (9 citations)

Adaptive **Delaunay** Triangulation for Attractor **Image** Coding F. Davoine and J.M. Chassery Laboratoire  
134 Tdsi Cnrs Abstract The Principle Of Attractor **Image** Coding Presented In This Paper Is Based On The  
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<ftp.informatik.uni-freiburg.de/papers/fractal/DaCh94.ps.gz>

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